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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/804,158	03/13/2001	Susumu Kawada	57454-037	8619

7590 09/16/2003

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EXAMINER	
SAGAR, KRIPA	
ART UNIT	**PAPER NUMBER**
1756	

DATE MAILED: 09/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/804,158	KAWADA ET AL.	
	Examiner	Art Unit	
	Kripa Sagar	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *6/16/03* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-71* is/are pending in the application.

4a) Of the above claim(s) *8-14 and 63-65* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,15-62 and 66-71* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 March 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Response to Amendment

1. The amendment filed 6/16/03 has been entered. Claims 66-71 have been newly added; no new matter has been introduced.

Claims 1-7,15-62, 66-71 are under consideration.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1,7,15,21,22,23,38,44, are rejected under 35 U.S.C. 102(b) as being anticipated by US Pat. 5635315 to Mitsui ('315 reference)

The instant claims recite a phase shift film, a phase shift mask (PSM) blank and a phase shift mask wherein the film is comprised of Mo, Si, O and N and is deposited by a long throw sputtering device.

Mitsui teaches a phase shift mask (PSM) film, mask blanks and a PSM wherein the phase shift film comprises Mo,Si,O and N (2;47-4;8 & fig.5).

Mitsui does not teach that the films are formed by a long throw sputtering device or method; however a MoSiON film formed by any method would function as well as the instant film, blank or mask.

4. Claims 60,61,62 are rejected under 35 U.S.C. 102(b) as being anticipated by US Pat.5942356 to Mitsui et al. ('356 reference)

The claim recites an exposure method using a PSM with a MoSiON film formed by long throw sputtering. Semiconductor devices are manufactured using the PSM.

Mitsui teaches an exposure technique using a PSM with a MoSiON film (17;6—18;36). The film is not formed by long throw sputtering – however the exposure technique would be equally successful with any phase shift mask having any phase shift feature formed by any method.

It teaches forming semiconductor devices using the PSM with MoSiON film (18;37-20;34). The devices are not formed, using the PSM with a film deposited by long throw sputtering – however the devices would function as well as that of the instant claim irrespective of the method of manufacture.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-7,15-21, are rejected under 35 U.S.C. 103(a) as being unpatentable over the '356 reference in view of JP 08-127870 to Nagatani et al. and further in view of US Pat.5938897 to Isao et al and further in view of US Pat. 5322605 to Yamanishi.

The grounds for rejection and the motivation for combining the references have been presented in the earlier office action.

7. Claims 22-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over the '356 reference in view of Nagatani et al. and further in view of Isao et al. and further in view of Yamanishi as applied to claims 15-21 above and further in view of the non-patented publication of Angelopoulos.

The grounds for rejection and the motivation for combining the references have been presented in the earlier office action.

8. Claims 66-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over the '356 reference in view of Nagatani et al. and further in view of Isao et al. and further in view of Yamanishi as applied to claims 1-7 above and further in view of the '315 reference

The instant claims recite film thickness and optical characteristics.

The '356 reference teaches a method of depositing MoSiON phase shifting films by reactive ion sputtering. The '356 reference teaches that the optical characteristics of the film can be adjusted (2;43-3;3) and teaches compositions and optical characteristics (T% and n) of films (figs.7,8). This is reinforced by the teachings of the '315 reference shown in Table 1 (col.5).

One of ordinary skill in the art at the time the invention was made would adjust the film forming conditions taught by the '315 and '356 references to arrive at the designed characteristics because both references teach the same method of solving the

same problem – viz. the adjustment of the film characteristics to the radiation used ('356: 2;28-43 & '315: 7;16-26)

Response to Arguments

9. Applicant's arguments have been considered but are not convincing.

Independent claims 1,15, 38 recite a generic phase shifting film, a PSM blank and a PSM with the dependent claims limiting the method of making the film on these products.

Independent claims 27 and 45 recite the process for making mask blanks and PSMs.

Applicant has argued that (a) Nagatani does not teach sputtering a phase shift film (b) Mitsui ('356) may not be combined with Nagatani since there is no obvious motivation (c) there is no expectation of success in combining the two references.

These arguments are not persuasive. The '356 reference teaches depositing a MoSiON phase shifting film by reactive ion sputtering. The difference between the '356 reference and the independent claims of the instant application is the use of the long throw sputtering (LTS) device to deposit the phase shifting film. The LTS device is known in prior art as admitted by Applicant (instant specification p.2) and as shown by Nagatani; it differs from the conventional device / method of the '356 reference in that the distance between the target and the source is increased (and hence the term "long throw"). The greater distance allows deposition angles more normal (perpendicular) to

the target surface and hence more uniform coverage. These are art-recognized facts amenable to instant verification as proven by the additional references below.

The '356 reference recognizes the criticality of forming thin uniform films for phase shifters (2;11-27). Nagatani teaches that the LTS method provides uniform coverage. One of ordinary skill in the art at the time of the invention would be motivated to use the LTS method to sputter the MoSiON of the '356 reference because it solves a problem identified by the'356 reference.

Applicant questions the teachings of Yamanishi and the motivation for combining Yamanishi with the teachings of the '356 reference and Nagatani. Yamanishi's teachings are in the same art as those of the '356 reference and Nagatani viz. vapor deposition techniques for thin films. It is particularly related to the '356 reference in that both methods use reactive ion sputtering and Yamanishi provides improvements to the process. The reaction of the ions with the source, in the conventional deposition devices, not only changes the kinetics of sputtering but also the composition of the source(1;65-2;10). This is a well-recognized phenomenon in vapor deposition and the '356 reference also indicates this (2;43-61). Thus an earlier sputtered layer from the source would differ in composition from a later sputtered layer and this difference would be reflected in the film (target). The use of two separate gases reduces this phenomenon and thus a more homogeneous film is deposited at a faster rate. Applicant recognizes and acknowledges other benefits and motivations for combining the references (p.18).

In summary Applicant's arguments against the references individually are not persuasive. The '356 reference teaches the method of forming a phase shift film of the instant composition using reactive ion sputtering and mixed gases. Nagatani suggests an improvement that results in a more uniform coating using the sputtering technique of the '356 reference while Yamanishi teaches another improvement to the sputtering device that results in a more homogeneous film deposited at a faster rate as pointed out by Applicant. The suggested changes would have been obvious to a skilled artisan.

Examiner recognizes that application of the LTS technique to the MoSiON target may not be as simple as changing the distance between the target and the source; it may require considerable experimentation and optimization of the deposition parameters. Applicant's argument in this regard is persuasive. Applicant is invited to limit the claims to the instant invention: As understood, this includes : the *method* of depositing a *MoSiON* phase shifting film, with optical characteristics tailored for ArF and KrF radiations, using a *long throw sputtering* device with separate gas inlets for the reactive and inert gases and with the *process parameters* that the Applicant has invented. The fabrication of mask blanks and PSMs with similar limitations may be allowable. Products formed by the process and generic phase shift films or methods would not be patentable.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US Pat. 5863393 to Hu teaches long throw sputtering to enhance uniform coverage of high topography substrates (4;28-41).

US Pat 6139698 to Wang et al teaches long throw sputtering to obtain uniform coverage (2;30-54).

US Pat. 6140236 to Restaino et al. teaches the principles behind long throw sputtering (1;33-46)

Non-Patent Publication of Motegi et al. teaches long throw sputtering for uniform coverage. (Jl.Vac Sc. Tech. B. v13,(1995) pp. 1906-1909).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 703-605-4427. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 703-308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

MH/ks

MARK F. HUFF
SUPERVISORY PATENT EXAMINER
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